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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,671	02/19/2004	Charles C. Lin	HT01-018B	5244

7590 01/11/2005

George O. Saile
28 Davis Avenue
Poughkeepsie, NY 12603

EXAMINER	
LETSCHER, GEORGE J	

ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/782,671	LIN ET AL.	
	Examiner	Art Unit	
	George J. Letscher	2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *22-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *22-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 22-35 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US 6,262,869) in view of Gill (US 6,538,856).

The aforementioned claims recite the following features, inter alia, disclosed in Lin et al '869: a top spin-valve giant magnetoresistive (GVR) sensor read head having a novel conductive lead overlay (342) configuration, comprising a substrate which is a lower shield (80) on which is formed a dielectric insulating layer (324); a seed layer (310) of 30 angstroms with GMR enhancing material formed on said dielectric layer; a ferromagnetic free layer (304) which is 45 angstroms NiFe and 6 angstroms CoFe formed on the seed layer; a metallic, non-magnetic spacer layer (302) of 28 angstroms Cu formed on, i.e., in a position of being attached to something, the ferromagnetic free layer; a antiferromagnetic pinned layer (306) formed on the spacer layer, said layer further comprising: an antiferromagnetic pinning layer (308) of 250

angstroms NiMn formed on said pinned layer; a first capping layer (312) of 50 angstroms Ta formed on said antiferromagnetic pinning layer; a longitudinal hard magnetic bias layer (348, 350) formed of 150 angstroms of CoPtCr as a contiguous junction against a first side portion of said sensor element; a conducting lead layer (352), formed overlaying said longitudinal hard magnetic bias layer of said sensor element layer and electrically contacting a second side portion of said sensor element; and the first side portion extending from a position between said metallic non-magnetic coupling layer to said metallic, non-magnetic spacer layer and the substrate while the second side portion extends from the capping layer to the hard bias layer upper surface. See Figure 16 of Lin et al.

Regarding claim 22, Lin et al does not teach its pinned layer being a synthetic antiferromagnetic pinned layer (SyAP) having first and second ferromagnetic layers with a metallic, non-magnetic coupling layer formed on the first ferromagnetic layer. Regarding claim 25, Lin et al do not show its 30 angstrom seed (GMR enhancing) layer being NiCr or NiFeCr. Regarding claims 28-30, Lin does not show the AP1, AP2 and coupling layer being from the group of CoFe, etc. with a thickness of 10-25 angstroms (AP1 and AP2) and coupling layer being Ru, etc. with a thickness of 3-10 angstroms. Regarding claim 31, Lin does not show its NiMn pinning layer being 50-200 angstroms. Regarding claim 32, Lin does not teach its capping layer being 20-40 angstroms.

Gill '856 shows: a top spin-valve giant magnetoresistive (GVR) synthetic antiferromagnetic pinned (hereafter "SyAP") read head having a conductive lead overlay configuration including a synthetic antiferromagnetic pinned layer (SyAP) comprising: a first ferromagnetic (pinned) layer, AP1 (210); a metallic, non-magnetic coupling layer (208) formed on said first ferromagnetic layer; a second ferromagnetic (pinned) layer, AP2 (212), formed on the metallic, non-magnetic coupling layer; an antiferromagnetic pinning layer (214) formed on, i.e., in a position of being attached to something, the SyAP layer; a first capping layer (222) formed on said antiferromagnetic pinning layer; see Figures 9-12 of Gill. The following materials and thicknesses are found in columns 7-8 of Gill: the substrate is a lower shield of a merged read-write head formation and said dielectric layer is an insulation layer between said shield and said sensor element; the seed layer is a layer of GMR property enhancing material formed from NiFeCr formed to a thickness of between approximately 30 and 100 angstroms; the ferromagnetic free layer is a double layer comprising a layer of NiFe, formed to a thickness of between approximately 0 and 8 angstroms, on which is formed a layer of CoFe to a thickness of between approximately 5 and 40 angstroms; the spacer layer of metallic, non-magnetic material is a layer of Cu and it is formed to a thickness of between approximately 15 and 30 angstroms; the first ferromagnetic layer, AP1, is a layer of ferromagnetic material chosen from the group of ferromagnetic materials consisting of CoFe, CoFeB, NiFe and

CoFeNiFe it is formed to a thickness of between approximately 10 and 25 angstroms; the second ferromagnetic layer, AP2, is a layer of ferromagnetic material chosen from the group of ferromagnetic materials consisting of CoFe, COFeB NiFe and CoFeNiFe and it is formed to a thickness of between approximately 10 and 25 angstroms; the metallic, non-magnetic coupling layer is a metallic nommagnetic material chosen from the group consisting of Ru, Rh and layer and it is formed to a thickness of between approximately 3 and 10 angstroms; the antiferromagnetic pinning layer is a layer of antiferromagnetic material chosen from the group consisting of MnPt MnPd, NiO, IrMn, FeMn and NiO and it is formed to a thickness of between approximately 50 and 200 angstroms; the capping layer is a layer chosen from the group consisting of Ta, NiCr or NiFeCr and is formed to a thickness between approximately 20 and 40 angstroms. See columns 7-8 of Gill for the cited thicknesses of the aforementioned materials.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have furnished the MR sensor having the aforementioned free layer/spacer/pinned/pinning layer arrangement as shown in Lin et al with pinned layer having first and second ferromagnetic layers with a metallic, non-magnetic coupling layer formed on the first ferromagnetic layer as taught by Gill. The rationale is as follows: one of ordinary skill in the art would have been motivated to have furnished the MR sensor having the aforementioned free

layer/spacer/pinned/pinning layer arrangement as shown in Lin et al with pinned layer having first and second ferromagnetic layers with a metallic, non-magnetic coupling layer formed on the first ferromagnetic layer as taught by Gill since the antiparallel pinned layer exerted a very low net demagnetizing field on the free layer; see column 3, lines 41-43 of Gill.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the MR sensor of Lin et al with a 30 angstrom seed (GMR enhancing) layer being NiCr or NiFeCr, the AP1, AP2 and coupling layer being from the group of CoFe, etc. with a thickness of 10-25 angstroms (AP1 and AP2) and coupling layer being Ru, etc. with a thickness of 3-10 angstroms, the NiMn pinning layer being 50-200 angstroms, the capping layer being 20-40 angstroms as shown in Gill. The rationale is as follows: one of ordinary skill in the art would have been motivated to have provided the aforementioned layer materials and respective thicknesses as shown by Gill since the appropriate thicknesses and exerted magnetic field by the second pinned anti-parallel layer were made to counterbalance the demagnetizing field from the AP pinned layer structure; see column 3, lines 44-48 of Gill.

3. Claims 36-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Gill as applied to claims 22-35 and 38 above, and further in view of Kroes et al (US 5,923,505).

The description of Lin et al and Gill is in paragraph 2, supra.

Regarding claims 36-37, Lin et al do not disclose the lead structure being a laminate of Ta/Au/Ta with a total thickness range between 140-620 Angstroms.

Kroes et al show a MR sensor having a lead structure (209) that is a Ta/Au/Ta laminate with overall thickness of 350 angstroms; see column 2, lines 55-57 of Kroes et al.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have furnished the MR sensor with a lead structure as shown by Lin et al with a Ta/Au/Ta lead structure having a thickness range between 140-620 Angstroms as taught by Kroes et al. The rationale is as follows: one of ordinary skill in the art would have been motivated to have furnished the MR sensor with a lead structure as shown by Lin et al with a Ta/Au/Ta lead structure having a thickness range between 140-620 Angstroms as taught by Kroes et al since this laminate provided a low resistivity material which connected the MR sensor and external circuitry, thereby improving sensor characteristics; see column 1, lines 30-36 of Kroes et al.

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to George J. Letscher whose telephone number is 703-305-7912.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on 703-305-6137. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

George J. Letscher
Primary Examiner
Art Unit 2653